
INSTRUCTION BOOK

OPERATING INSTRUCTIONS

**TERMALINE[®] WATTMETTER
MODELS 6104, 6154, 6156**



Bird Electronic Corporation

Cleveland (Solon) Ohio USA

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Safety Precautions

General Safety Statements

The following are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood, and apply to all phases of operation and maintenance.

Keep Away From Live Circuits

Operating personnel must at all times observe general safety precautions. Do not replace components inside equipment with the high voltage supply turned on. To avoid casualties, always remove power.

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

Safety Earth Ground

An uninterruptible earth ground must be supplied from the main power source to test instruments. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly supplied.

Shock Hazard

Do not attempt to disconnect an RF transmission line while RF power is present. Radiated RF power is a potential health hazard.

Resuscitation

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

Safety Symbols

WARNING

Warning notes call attention to a procedure, which if not performed correctly, could result in personal injury.

CAUTION

Caution notes call attention to a procedure, which if not performed correctly, could result in damage to the equipment.



This symbol appears on the equipment indicating there is important information in the instruction manual regarding that particular area.

 Note: Calls attention to supplemental information.

Warning Statement

The following safety warning appears in the text where there is danger to operating and maintenance personnel, and is repeated here for emphasis.

WARNING

Never attempt to connect or disconnect equipment from the transmission line while RF power is being applied. Leaking RF energy is a potential health hazard.

Caution Statements

The following equipment cautions appear in the text where the equipment is in danger of damage and are repeated here for emphasis.

CAUTION

The diode assembly is an ESD sensitive assembly, use proper ESD precautions.

CAUTION

Do not replace coolant with anything but the specified fluid. The inner shell of the resistor housing is contoured to the dielectric properties of this fluid. The use of any other type of coolant will affect the electrical performance of the load.

Safety Statements



USAGE

ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENT'S SAFETY PROTECTION.

USO

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

BENUTZUNG

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIE GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

UTILISATION

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

IMPIEGO

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.



SERVICE

SERVICING INSTRUCTIONS ARE FOR USE BY SERVICE -TRAINED PERSONNEL ONLY. TO AVOID DANGEROUS ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

SERVICIO

LAS INSTRUCCIONES DE SERVICIO SON PARA USO EXCLUSIVO DEL PERSONAL DE SERVICIO CAPACITADO. PARA EVITAR EL PELIGRO DE DESCARGAS ELÉCTRICAS, NO REALICE NINGÚN SERVICIO A MENOS QUE ESTÉ CAPACITADO PARA HACERLO.

WARTUNG

ANWEISUNGEN FÜR DIE WARTUNG DES GERÄTES
GELTEN NUR FÜR GESCHULTES FACHPERSONAL.

ZUR VERMEIDUNG GEFÄHRLICHER, ELEKTRISCHER
SCHOCKS, SIND WARTUNGSARBEITEN
AUSSCHLIEßLICH VON QUALIFIZIERTEM SERV-
ICEPERSONAL DURCHZUFÜHREN.

ENTRETIEN

L'EMPLOI DES INSTRUCTIONS D'ENTRETIEN DOIT
ÊTRE RÉSERVÉ AU PERSONNEL FORMÉ AUX OPÉRA-
TIONS D'ENTRETIEN. POUR PRÉVENIR UN CHOC
ÉLECTRIQUE DANGEREUX, NE PAS EFFECTUER
D'ENTRETIEN SI L'ON N'A PAS ÉTÉ QUALIFIÉ POUR
CE FAIRE.

ASSISTENZA TECNICA

LE ISTRUZIONI RELATIVE ALL'ASSISTENZA SONO
PREVISTE ESCLUSIVAMENTE PER IL PERSONALE OP-
PORTUNAMENTE ADDESTRATO. PER EVITARE PERI-
COLOSE SCOSSE ELETTRICHE NON EFFETTUARE
ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A
FARLA.

About This Manual

This instruction book covers the model 6104, 6154, and 6156 Termaline RF Wattmeters

This instruction book is arranged so that the essential information in safety appears in the front of the book. Reading the Safety Precautions section before operating the equipment is strongly advised.

The remainder of this Instruction Book is divided into Chapters and Sections. At the beginning of each chapter, a general overview describes the contents of that chapter.

Operation

First time users should read Chapter - 1 Introduction, Chapter 2 - Theory of Operation, and Chapter 3 - Installation, to get an overview of equipment capabilities and installation. An experienced operator can refer to Chapter 4 - Operating Instructions. All instructions necessary to operate equipment appear in this chapter.

Maintenance

All personnel should be familiar with preventative maintenance found in Chapter 5 - Maintenance. If a failure should occur, the troubleshooting section will aid in isolating and repairing the failure.

Parts

For location of major assemblies or parts, refer to the parts lists and associated drawings in Chapter 5.

Changes To This Manual

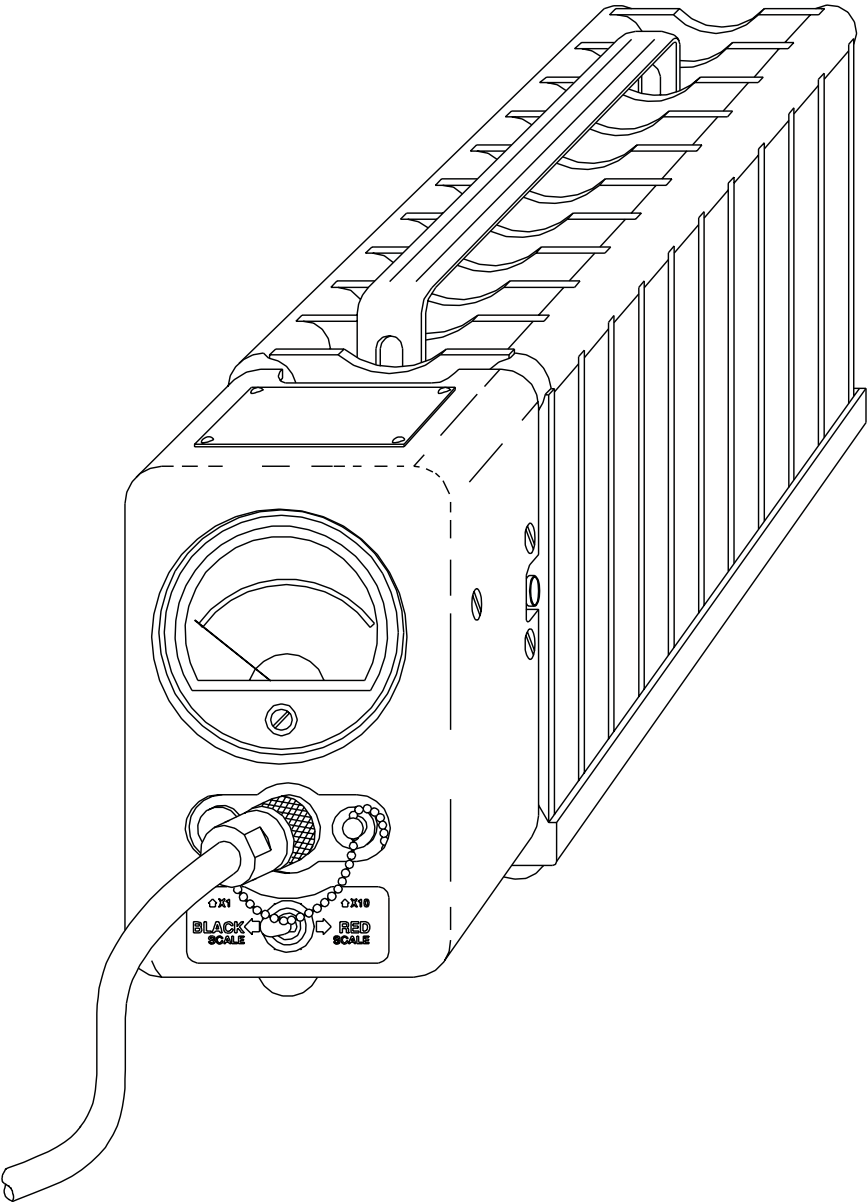
We have made every effort to ensure this manual is accurate. If you should discover any errors or if you have suggestions for improving this manual, please send your comments for our factory. This manual may be periodically updated. When inquiring about updates to this manual refer to the part number and revision level on the title page.

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Figure 1
Models 6154 and 6156



Purpose and Function

This instruction book is intended for use by operators of the Models 6104, 6154 and 6156 Termaline Wattmeters. These wattmeters measure RF power under nonradiating conditions. They provide a practically reflectionless, 50 ohm, line termination for up to 1000 MHz. Refer to the Specifications section for individual unit specifications.

The Models 6104, 6154, and 6156 Wattmeters are intended for general field and laboratory use on CW, AM and FM modulation envelopes.

Description

The Termaline Wattmeter consists of an RF coaxial load, dc cable, meter, crystal diode, and the housing.

The load is comprised of an RF coaxial load resistor assembly encased in a finned radiator. A voltmeter is mounted to the radiator. A 3-1/2 foot coaxial cable, RG-58/U, connects the resistor voltmeter assembly to the meter. The meter is sealed and shock mounted on its housing.

A crystal diode is furnished with the wattmeter. The diode is housed in the resistor-voltmeter assembly.

Power input is measured by a four range crystal voltmeter indicating directly in watts. Flipping the toggle switch determines the scale. Each scale has two ranges which are selected by plugging the crystal diode into the proper socket.

The fully assembled unit is shown in figure 1.

Specifications

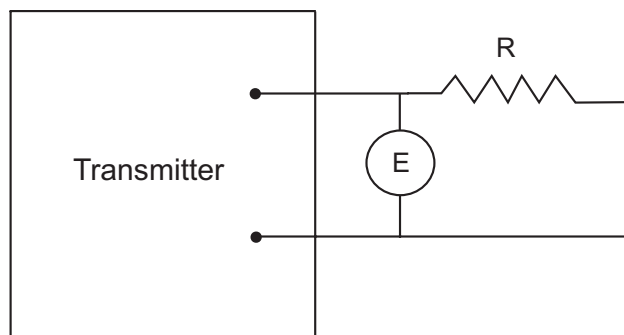
Impedance	50 ohms nominal						
VSWR	1.10:1 maximum across unit frequency range, with Female "N" conn.						
Connectors	Bird "QC" type female N normally supplied						
Load Power Rating: Model 6104 Models 6154 and 6156	80 W continuous 150 W continuous						
Power Scales: Model 6104 Models 6154 and 6156	<table> <tr> <th>Low Scale (Black)</th><th>High Scale (Red)</th></tr> <tr> <td>0-2 & 0-20</td><td>0-6 & 0-60</td></tr> <tr> <td>0-5 & 0-50</td><td>0-15 & 0-150</td></tr> </table>	Low Scale (Black)	High Scale (Red)	0-2 & 0-20	0-6 & 0-60	0-5 & 0-50	0-15 & 0-150
Low Scale (Black)	High Scale (Red)						
0-2 & 0-20	0-6 & 0-60						
0-5 & 0-50	0-15 & 0-150						
Frequency Range: Model 6154 Models 6104 and 6156	25 - 1000 MHz 25 - 512 MHz						
Accuracy: Models 6104 and 6156 Model 6154	± 5% of full scale ± 5% of full scale (25 - 512 MHz) ± 10% of full scale (512 - 1000 MHz)						
Dimensions: Model 6104 Models 6154 and 6456	9-5/8" L x 6-61/64" W x 6-3/8" H (244.5 x 100 x 162 mm) 12-5/32" L x 3-61/64" W x 6-3/8" H (309 x 100 x 162 mm)						
Coolant Capacity	0.1 gal (378.5 ml)						
Weight, Nominal: Model 6104 Models 6154 and 6156	7 lb (3.2 kg) 8 lb (3.6 kg)						
Operating Position: Load Meter Housing	Horizontal only Vertical or flat						
Finish	Grey Powder Coat						
Meets European Standards	EN 55011 Class B and EN 50082-2, which are in accordance with council directives 89/336/EEC and 92/31/EEC. EN 61010-1, which is in accordance with council directive 73/23/EEC and 93/68/EEC.						

Chapter 2

Theory Of Operation

The method of power determination used in the Termaline Wattmeter may be expressed as $W=E^2/R$ where E is the voltage across the resistance R , and W is the power in watts. Figure 2 illustrates the E^2/R power measurement used in the wattmeters. RF energy flows from the transmitter through resistance (R), producing a voltage drop across this resistor. The RF voltage is rectified by a crystal diode and voltmeter (E) records the drop. It is important that the output impedance of the wattmeter be equal to the resistance (R), and that the voltmeter is accurate at the operating frequency.

Figure 2
Power
Measurement



Voltmeter Circuit

Basically, the voltmeter consists of two separate filtered half-wave rectifier circuits. The active circuit is selected by inserting the crystal diode into the desired socket and setting the toggle switch to the selected scale.

RF Load Resistor

The RF load resistor of this series wattmeter, consists essentially of a cylindrical film type resistor immersed in a dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in a specially tapered housing which provides a linear reduction in surge impedance directly proportional to the distance along the resistor. This produces the uniform, practically reflectionless line termination over the frequency range of the wattmeter.

The dielectric coolant is chosen for its desirable dielectric properties and thermal characteristics. Cooling of the load is accomplished by natural fluid and air convection. The dielectric coolant carries the electrically generated heat from the resistor to the walls of the cylindrical cooling tank. The

tank is encased in a set of metal radiating fins, which are firmly pressed on the cylinder. The heat from the dielectric oil is transferred to the surrounding air by the radiating fins.

A synthetic rubber diaphragm located in the rear dome on the load allows the coolant to expand as the temperature rises.

This chapter provides information for preparing the Models 6104, 6154, and 6156 for use.

Location Free air circulation around the wattmeter is essential. Position the equipment with clearance around it and do not place it near heated surfaces. The wattmeter should have at least a four inch clearance on all sides. The space above the equipment should be kept unobstructed for good heat transfer. Use the load portion of the wattmeter in a horizontal position only. The meter housing may be detached and used in a horizontal or vertical position.

Mounting The Models 6104, 6154, and 6156 are essentially portable test instruments. Place the wattmeter as close as possible to the equipment of which the RF power is being measured.

The wattmeter may be fastened to a work or test surface. The bumpers are fastened to the radiator brace by 8-32 studs which are set permanently into the rubber feet. The bumpers unscrew easily by hand. The holes are threaded for 8-32 screws and fasteners. The holes are on a 3 by 7 inch rectangle, (76 x 178 mm).

To mount the unit to a work or test surface, follow the instructions below.

1. Remove the four rubber bumpers from the bottom of the radiator.
2. Place the screws up through the work surface and into the radiator.
3. Secure the radiator to the work surface with appropriate fasteners.

**Latch
Mechanism**

The meter housing is retained on the radiator by the bowed-spring action of the latch spring, which is a rod of heavy wire. While following the removal and assembly instructions, refer to figure 4.

To remove the meter case:

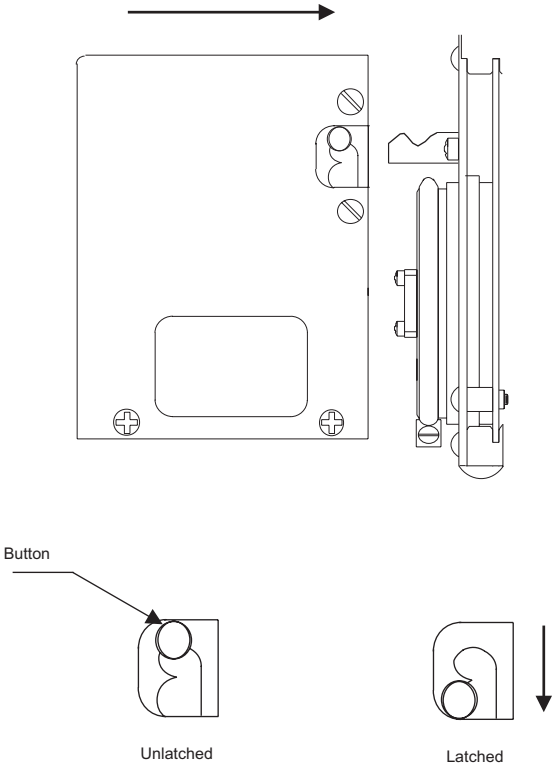
1. Raise the buttons at the sides of the case, one at a time, to lift the spring

- above the notch on the hook. Use a flat blade screwdriver.
2. Pull the housing straight off of the radiator.
 3. Place the meter in a convenient location for use. The meter may be read either standing, or on its back.

To assemble the meter case:

1. Coil the dc cable so that it will allow the meter case to be replaced properly on the load.
2. Engage the spring, first on button, then the other. The second button will resist with stiff spring action.
3. Check for proper engagement by pulling on the meter case.

Figure 3
Latch
Operation



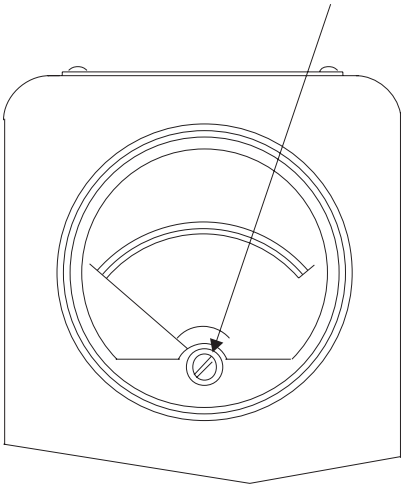
**Transmitter
Connection**

Connection to the transmitter is made through a suitable coaxial cable equipped with appropriate RF connectors. Keep the length of this cable as short as possible.

1. Connect the wattmeter to the transmitter with a short length of 50 ohm coaxial cable such as RG-58C/U (preferably under 5 feet in length).
2. The wattmeter is ready to be used for power measurements.

Figure 4
Zero Adjust

Zero Adjust Screw



Chapter 4

Operating Instructions

WARNING

Never attempt to connect or disconnect equipment from the transmission line while RF power is being applied. Leaking RF energy is a potential health hazard.

Operating Precautions

Before operating the equipment, perform the following steps:

1. Carefully check the condition of the RF cable and connectors used in the circuitry.
2. The RF cable lengths, adapters and connectors should be kept to a minimum.
3. When other than 50 ohm connectors are used, keep at the transmitter jack only. This will keep the RF cable free from standing waves.

Operator's Test for Accuracy

Operating checks should consist mainly of comparison between this wattmeter and a Thruline Wattmeter or other wattmeters of the same type. This will indicate an accuracy of within ± 10 percent full scale due to the ± 5 percent full scale limits of each instrument. Repeat the cross-check several times to eliminate possible error from transmitter variations.

Frequency Response

These wattmeters are broad band instruments. Misreading can occur with the presence of harmonics or spurious frequencies. To prevent misreading due to harmonics, connect a low pass filter between the transmitter and wattmeter. Do not continue operation of the wattmeter when large spurious responses are present.

Zero Adjust

If the meter pointer does not read zero under no-load conditions, turn the zero adjust screw (located below the meter face) slightly to the right or left with a small screwdriver until the pointer is exactly on the zero mark. Refer to figure 4.

CAUTION

The diode assembly is an ESD sensitive assembly, use proper ESD precautions.

**Measuring
Transmitter
Power**

1. Place the wattmeter in a position where the meter can be seen while the transmitter is being adjusted.

 **Note:** The meter indicates power dissipated in the load portion of the instrument.
2. Connect the wattmeter to the transmitter with a short piece of 50 ohm cable, preferably under five feet in length.

 **Losses** introduced by the cable between the transmitter and the wattmeter, if significant, must be added to the power indicated on the wattmeter scale.
3. Plug the crystal diode into either the Black (Low, x1) or Red (High, x10) range socket. Make sure the diode snaps into place. Flip the switch, on the meter, to either the Black Scale or the Red scale, depending on the power to be measured.

 **Note:** If you are unsure of the power to be measured, plug the diode into the high range socket (red side).
4. Apply transmitter power.
5. Rotate the diode in the socket to obtain the maximum deflection on the meter. The deflection should not exceed one division.
6. Make power measurements.

When switching from the wattmeter back to the antenna, it may be necessary to retune the transmitter slightly. This is due to the difference in VSWR between the wattmeter and the transmitter's antenna.

**Dummy
Antenna**

The Wattmeter may be used as a 50 ohm coaxial termination for transmitters with a power output up to 80 or 150 W respectively from dc to 4000 Mhz.

CAUTION

The diode assembly is an ESD sensitive assembly, use proper ESD precautions.

To protect the meter and crystal diode when using the equipment as a dummy antenna:

1. Remove the diode from the voltmeter block.
2. Disconnect the meter at the dc plug.

Chapter 5

Maintenance

This chapter covers the cleaning, inspection, troubleshooting, and replacement parts.

Troubleshooting

The troubleshooting table below will aid in isolating and repairing a failure.

Table 1
Troubleshooting
Table

Problem	Possible Cause	Remedy
Coolant oil leaking around clamping band or radiator housing.	Clamping bands not tight.	Tighten slightly with a screwdriver.
Radiator Overheating	Faulty O-Ring (front)	Replace O-Ring
	Faulty diaphragm (rear)	Replace diaphragm
	Transmitter power too high.	Reduce transmitter power.
	Coolant level too low.	Add more coolant to the radiator.
	Accumulation of dirt on cooling fins.	Clean the fins.
Incorrect power reading.	Faulty RF section assembly.	Replace the RF section.
	Defective diode.	Return the unit and diode to an authorized service facility for replacement and calibration.
	Loose meter cable	Tighten cable connector.
	Switch is in the wrong position.	Place switch in the proper position.
	Diode is in the wrong range socket.	Put diode in correct range socket.

Inspection

Periodic inspection is necessary at about six month intervals. Inspection should include the following items.

Oil Leakage

Check for coolant leakage around the front and rear clamping bands. The level of the dielectric coolant should remain constant under normal use. The filler plug is on the conical reducer, behind the voltmeter block, at the lower right. To check the dielectric coolant level:

1. Move the unit so that the filler plug is in the up position.
2. Remove the filler plug using a 3/16 inch hex wrench.
3. Check coolant level. The coolant should be within 1/4 inch of the inside thread of the socket. If the coolant appears to be contaminated, replace it. The capacity is 0.1 gal. (378.5ml).

CAUTION

The diode assembly is an ESD sensitive assembly, use proper ESD precautions.

Crystal Diode

Occasionally lubricate the O-Ring seal on the crystal diode. Use a nonmelting dielectric compound. Check the contact fingers of the shield for proper contact to the voltmeter socket. Bend slightly, make sure not to damage the center pin of the diode.

Do not interchange the diode supplied with the unit with those of any similar wattmeter.

 **Note:** If the diode assembly is replaced the wattmeter *must* be calibrated.

Resistor Voltmeter Assembly Replacement

A faulty resistor voltmeter assembly must be replaced in its entirety. No attempt should be made to repair the assembly. To replace it, use the following procedure.

1. Remove the meter from the load.
2. Remove the filler plug and drain off approximately two ounces of coolant. Refer to the Oil Leakage paragraph.

3. Disconnect the dc plug from the volt-meter block.
4. Place the load in a vertical position with the voltmeter up.
5. Loosen the 8-32 x 1 inch screw from the clamping band and remove the clamping band.
6. Lift the resistor voltmeter assembly out of the radiator. Allow the coolant to drain off before removing the assembly from the unit..
7. Inspect the O-Ring seal. Do not reuse if it is no longer pliable or shows signs of surface cracks.
8. Inspect the coolant; if it appears to be contaminated replace it.
9. Reverse the above procedure to replace the assembly.

Diaphragm Replacement

To replace a faulty diaphragm use the following procedure.

1. Stand the wattmeter vertically, with the back end up.
2. Loosen the clamp screw until the clamping band is released.
3. Remove the diaphragm cap and carefully lift the diaphragm from the back end of the radiator tank.
4. Reverse the above procedure to assemble the unit.

 **Note:** The coolant level should be about one inch below the top of the radiator cylinder. The coolant should be a clear to a light yellow color. If it is not, it may be contaminated and should be replaced.

Meter Replacement

The microammeter is shock mounted in its housing. Do not attempt to repair the meter if it fails. Follow the procedure below to replace it.

1. Remove the meter case from the load.

2. Remove the dc cable and terminal strip from the meter by loosening the two 8-32 hex nuts on the meter terminals.
3. Place the meter face down on a smooth clean surface.
4. Press down evenly on the retainer ring. While pressing the retainer ring, unscrew the two 10-32 flat head machine screws on the sides of the meter case.

 Note: There is one screw on each side.

5. Remove the meter with the retainer ring and sponge rubber strips.
6. To install a new meter, reverse the above procedure.

Switch Replacement

While performing the following procedure, refer to figure 5.

1. Remove the terminal board as described in the Meter Replacement paragraph.
2. Unsolder the switch leads from the terminal board. Do not overheat the shunt resistor.
3. Remove the toggle switch by unscrewing the 15/32-32 face nut.
4. Reverse the preceding procedure to replace the switch.

DC Cable and Plug Service

1. Remove the cable from the plug by unscrewing the bushing and pulling the cable out. The center conductor of the cable makes snug contact between the turns of the coil spring when assembled.

Figure 5
Switch
Assembly

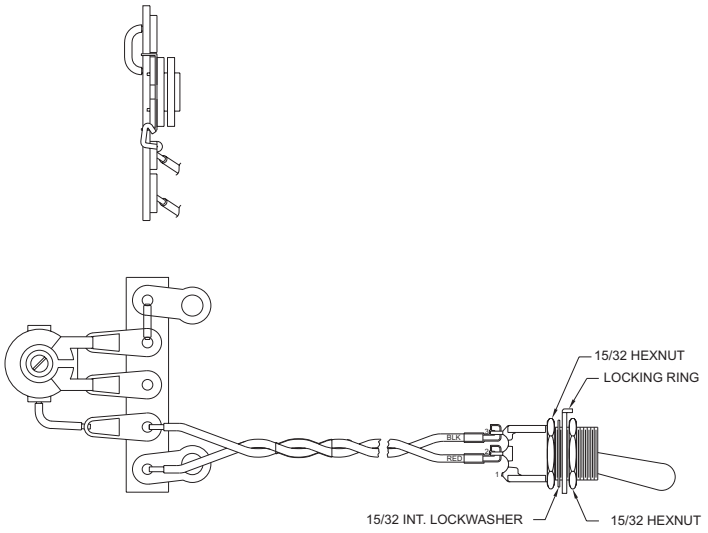


Figure 6
DC Cable
Assembly

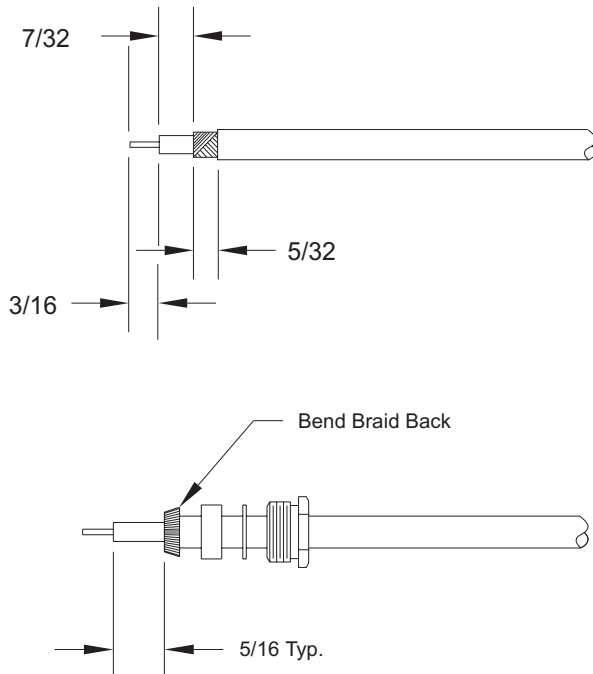
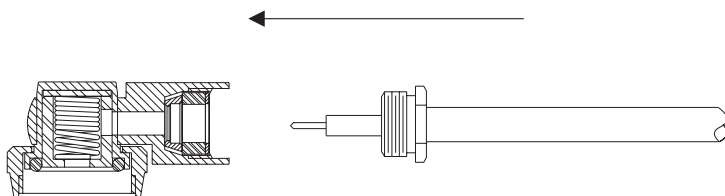


Figure 7
DC
Connector
Assembly



2. To assemble the cable, RG58/U, to the dc plug, slip the bushing, washer, and grommet over the end of the cable. Refer to figure 6.
3. Remove the outer insulation 9/16 inch from the end.
4. Slip the collar over the shielding (un-braided).
5. Fold back the braids and trim them. Remove the insulation to the dimension shown. Refer to figure 6.
6. Flatten the end of the center conductor to a sharp chisel edge. Push it into the dc plug making sure the edge of the center conductor is aligned with turns of the coil spring. Refer to figure 7.
7. Push in the grommet and washer then screw the bushing down snug.

Cleaning

It is necessary to keep the following areas clean

- ♦ The outside of the wattmeter
- ♦ Radiator fins
- ♦ Connector and diode contacts

Excessive dust and lint on the cooling fins will interfere with the efficient dissipation of heat. Periodically wipe, with a soft cloth, the accumulated dust and lint off of the radiator fins. If the teflon insulator or metallic contact surfaces of the connector should become dirty, wipe off with a soft cloth. To clean the connector and diode contacts; use a contact

cleaner that is self-drying, and does not leave a residue on the inaccessible internal parts.

Customer Service

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Fax: (440) 248-5426

Sales Offices

For the location of the Sales Office nearest you, give us a call or visit our Web site at:

<http://www.bird-electronic.com>

Replacement Parts

 Note: If the crystal diode is replaced all models of the wattmeter *must* be calibrated.

Model 6104

Qty.	Description	Part Number
1	Meter mount shock strip	5-1066
1	Meter shock mount	4220-087
1	Resistor voltmeter assembly (calibrated)	6104-002-1
1	Radiator assembly	2400-058
1	Crystal diode	7500-147
1 pint (473ml) container	Coolant	5-030
1	Toggle switch (SPST)	5A2154
1	Switch assembly (includes: toggle switch, Terminal strip and trimmer potentiometer)	6154-012
1	Handle	2400-017
1	Clamp band assembly	7500-254
1	Meter	280-034
1	Meter mount shock ring	4410A261
1	Radiator seal O-Ring	7500-065
1	DC plug	7500-076
1	DC cable (includes a dc plug)	4220-097-2
1	Diaphragm	2400-015
1	Diaphragm cap	2400-050
1	Chain & anchor assembly	6700-021
4	Bumper foot	5-049
2	Gasket	7500-153

Models 6154 & 6156

Qty.	Description	Part Number
1	Resistor voltmeter assembly (calibrated)	6154-002-1
1	Radiator assembly	2400-059
1 pint (473ml) container	Coolant	5-030
1	Switch assembly (includes: toggle switch, Terminal strip and trimmer potentiometer)	6154-012
1	Meter	2080-026
1	Meter mount shock ring	4410A261
1	Radiator seal O-Ring	5-229
1	DC plug	7500-076
1	Meter mount shock strip	5-1066
1	Meter shock mount	4220-087
1	Crystal diode	7500-147
1	Toggle switch	5A2154
1	Handle	2400-017
1	Clamp band assembly	7500-254
1	DC cable (includes DC plug)	4200-097-2
1	Diaphragm	2400-015
1	Diaphragm cap	2400-050
1	Chain & anchor assembly	6700-021
1	Bumper foot	5-049
2	Gasket	7500-153

Note: The resistor voltmeter assembly is only supplied factory calibrated and includes crystal diode, chain and anchor assembly, and gaskets.

Limited Warranty

All products manufactured by Seller are warranted to be free from defects in material and workmanship for a period of one (1) year, unless otherwise specified, from date of shipment and to conform to applicable specifications, drawings, blueprints and/or samples. Seller's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by Seller.

If Seller's products are claimed to be defective in material or workmanship or not to conform to specifications, drawings, blueprints and/or samples, Seller shall, upon prompt notice thereof, either examine the products where they are located or issue shipping instructions for return to Seller (transportation-charges prepaid by Buyer). In the event any of our products are proved to be other than as warranted, transportation costs (cheapest way) to and from Seller's plant, will be borne by Seller and reimbursement or credit will be made for amounts so expended by Buyer. Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing within ten (10) days from the date of discovery of the defect.

The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's request and/or to Buyer's specifications. In addition, Seller's warranties do not extend to the failure of tubes, transistors, fuses and batteries, or to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to Seller.

The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR SELLER ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.

DECLARATION OF CONFORMITY

Manufacturer: Bird Electronic Corporation
30303 Aurora Road
Cleveland, Ohio 44139-2794

Product: Termaline Coaxial Load Resistor
Models: 6104 6154 6156

The undersigned hereby declares, on behalf of Bird Electronic Corporation of Cleveland, Ohio, that the above-referenced product, to which this declaration relates, is in conformity with the provisions of the following standards;

1. European Standard EN 55011:1991 - Emissions: Class B.
2. European Standard EN 50082-2:1995 - Immunity: Commercial, Residential and Light Industrial Environments.

These standards are in accordance with Council Directive 89/336/EEC, on Electromagnetic Compatibility, as amended by Council Directive 92/31/EEC.

The technical documentation file required by this directive is maintained at the corporate headquarters of Bird Electronic Corporation, 30303 Aurora Road, Cleveland, Ohio.



Ken DeVore
QA/Metrology Manager
Bird Electronic Corporation